Evaluation of Neutron Cross Sections for Nd-143, Nd-145, Sm-147 and Sm-149 from 1 keV to 20 MeV

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Abstract

The neutron induced nuclear data for Nd-143, Nd-145, Sm-147 and Sm-149 were calculated and evaluated from 1 keV to 20 MeV. The energy dependent optical model potential parameters were extracted based on the recent experimental data and the s-wave strength function was calculated. Spherical optical model and statistical model in equilibrium energy and multistep direct and multistep compound model in preequilibrium energy were introduced in EMPIRE. The theoretically calculated cross sections were compared with the experimental data and the evaluated files on (n, tot), (n, n), (n, n'), (n, g), (n, p), (n, a), (n, 2n), (n, 3n), (n, np), (n, n) reactions.The model calculated cross sections gave quite well agreement with the reference experimental data. The evaluated cross sections were compiled to ENDF-6 format.

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Generation of Isotropic and Anisotropic Scattering Cross Sections for Boltzmann-Fokker-Planck Equation via Decomposition and Minimized RMS Errors

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Abstract

Handling the highly anisotropic scattering of fast neutrons with conventional methods usually means that high-order Legendre expansions are necessary to obtain correct angular fluxes. This drawback in standard transport calculations is avoided by applying the Boltzmann-Fokker-Planck (BFP) equation approach which has been used in both neutral and charged-particle transport problems. Previously, Caro and Ligou, and Morel have introduced Fokker-Planck decomposition methods, which decompose elastic scattering cross section into forward-peaked and smooth components. A new method for decomposing scattering cross sections for Boltzmann-Fokker-Planck equation is presented. We start from the basic data $\sigma_s(\mu)$(given by ENDF/B-VI) to get more correctly determined BFP data. In this method, we use Legendre expansion for smooth component and exponential function, which Caro and Ligou used in their paper, for forward-peaked component. In addition, by using RMS errors and an extra degree of freedom (Y), we conserve both moment and scattering cross section.